Citation:

Nakamura Y, Iso H, Kita Y, Ueshima H, Okada K, Konishi M, Inoue M, Tsugane S. Egg consumption, serum total cholesterol concentrations and coronary heart disease incidence: Japan Public Health Center-based prospective study. *Br J Nutr.* 2006 Nov;96(5):921-8.

PubMed ID: 17092383

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the association of egg consumption and total cholesterol concentration with coronary heart disease (CHD) incidence.

Inclusion Criteria:

- Cohort I: residence in 4 specific prefectures of Japan, age 40-59, Japanese.
- Cohort II: residence in 5 specific prefectures of Japan, age 40-69, Japanese.

Exclusion Criteria:

- Self-reported medical history of myocardial infarction, IHD, stroke or cancer
- No egg consumption data.

Description of Study Protocol:

Recruitment: Japan Public Health Center-based Cohort I and II

Design: Prospective cohort study

Blinding used (if applicable)

Those reviewing medical records were blinded to the lifestyle data.

Intervention (if applicable): not applicable

Statistical Analysis

- The x^2 test was used to compare dichotomous variables
- One-way ANOVA to compare means among the four groups according to egg consumption.

- The Mantel-Haenszel x^2 statistical test was used to detect deviation from linearity in the association between nominal variables and the categories of egg consumption, and the ANOVA was used to detect deviation from linearity in the association between continuous variables and the categories of egg consumption.
- To examine the association between egg consumption and CHD incidence, the age and sex- and multivariate-adjusted hazard ratios for CHD incidence using a Cox's proportional hazard model were calculated.
- Tests of linear trends across groups were conducted by assigning an ordinal value from 1 to 4 for each level of consumption and modelling this as a continuous variable in separate Cox proportional hazard models.

Data Collection Summary:

Timing of Measurements

- Cohort I: 1990 and cohort II: 1993-1994 for questionnaire and medical record cholesterol data, respectively. Incidence of CHD through 2001.
- In cohort, participants self-reported egg consumption as less than 1 d/wk, 1-2 d/wk, 3-4 d/wk, and almost every day.
- In cohort II, participants were also given the option of never consuming eggs

Dependent Variables

- Acute myocardial infarction (symptoms plus either diagnostic electrocardiogram changes or elevated cardiac enzymes)
- Fatal CHD (systematic search for death certificates)

Independent Variables

- Egg consumption (questionnaire)

Control Variables

- Age
- Sex
- BMI
- Hypertension
- Diabetes
- Use of cholesterol-lowering drugs
- Smoking
- Alcohol drinking
- Whether or not intended to avoid cholesterol-rich diets
- Consumption frequencies of meat, fish, vegetables, and fruit
- Cohort effects

Description of Actual Data Sample:

Initial N: Cohort I: 54,512 (27,439 males, 27,073 females), Cohort II: 62,415 (31,750 males, 30,665 females)

Attrition (final N): 54,350 in cohort I and 62,288 in cohort II

Age: 55.1 years for eggs < 1 d/wk; 51.9 years for eggs 1-2 d/wk; 51.9 years for eggs 3-4 d/wk and 52.8 years for eggs almost daily

Ethnicity: Japanese

Other relevant demographics:

Anthropometrics

Location: Japan

Summary of Results:

Key Findings:

- During the meal follow up of 10.2 yrs, there were 462 incident cases of CHD (120 fatal, 342 non-fatal).
- Subjects with total cholesterol > 2200 mg/L were less frequent in frequent egg consumption groups in both cohorts (P for trend < 0.0001).
- Subjects with <1 day/week of egg consumption were more likely to avoid a cholesterol-rich diet.
- Egg consumption was not associated with the risk of CHD, although total cholesterol was significantly related to the risk of CHD.
- The multivariate hazard ratio of CHD in subjects with total cholesterol >2400 versus <1800 mg/L was 2.17 (95% confidence interval: 1.22, 3.85, P for trend = 0.0018).
- There was no significant association between egg consumption and CHD incidence.

***Other Findings**

- The fewer eggs eaten, the more frequently the subjects intended to avoid a cholesterol-rich diet (P<0.0001).
- Dietary intake of meat, fish, vegetables and fruit was more frequent among those in the more-frequent egg consumption group (P<0.0001).
- Cholesterol-lowering drugs were taken more frequently in the less-frequent egg consumption groups (P<0.0001).
- Hypertension was more frequent in the less-frequent egg consumption group (P<0.0001).
- Weekly drinkers were less frequent in the <1 d/wk egg consumption group.
- There was an inverse correlation between egg consumption and mean total cholesterol levels (P<0.0001).

Author Conclusion:

Eating eggs, up to almost daily, was not associated with any increase in CHD incidence. There was an inverse correlation between egg consumption and the frequency of hypercholesterolemia, probably because people with hypercholesterolemia avoided eating eggs.

Reviewer Comments:

Egg consumption only measured at baseline, and was measured in number of days/week versus number of eggs per week. Authors note the following limitations:

- *Portion sizes were not specified on the food frequency questionnaires, so nutrient intake values are not reliable*

- *Total energy intake could not be used as a covariate in the analyses*
- *Total cholesterol concentration only available for some of the subjects*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes

3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	No
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	No
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A

6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	No
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	N/A
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes

8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes